Studies on Sensory Deprivation: V. Part 4. Effect of Sensory Deprivation on Verbal Learning and Recall

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PART 4. EFFECT OF SENSORY DEPRIVATION ON VERBAL LEARNING AND RECALL

By

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The effect of sensory deprivation on learning and memory is investigated by use of recall test, verbal maze learning, serial learning and immediate memory. The results showed no significant difference between experimental and control group concerning the recall of past experiences, the rate of verbal learning and the amount of immediate memory. In the immediate memory, however, results that are considered to show some impairment of organizing process of memory are obtained.

In the previous paper (2), it was suggested that sensory deprivation has a facilitative effect on retention of verbal material learned before confinement. The results was substantially consistent with those of such other reports as were referred to there.

Now, learning process in a broad sense can be considered to consist of learning, retention and recall or recognition process. If the effect of sensory deprivation on retention is determined, then the effect on the other processes should be asked. Although many studies have been devoted to investigate the effect on learning (1, 3), there is no agreement among their results. Few experiments have been conducted on the effect on recall.

In the present study, the effect of sensory deprivation on learning and recall is investigated.

Method

Following 4 tests 1)–4) were administered. Test 2) and 3) consisted of both pre- (before isolation) and post- (after isolation) test. Test 1) and 4) consisted of post-test alone. Tests were given through an interphone to Ss who were lying on the bed in the cubicle.

1) Recall test; i) to reproduce the question of English composition Ss were given in the entrance examination 4 months ago. ii) to recall the name and appearance of the classmate who was sitting next to him in the classroom when he was in 1st year of the high school, the middle school and the primary school successively without time restriction.

2) Learning of a verbal maze; to learn a verbal maze of L-, R- 10-choice-points presented aurally at the rate of an item every 2 sec. at 4 sec. inter-list interval by the anticipation method to the criterion of one perfect trial.

3) Serial learning. At the pre-test 8 Japanese 3-syllable adjectives (familiality value 9.4–9.6) and at the post-test 8 Japanese 2-letter syllables (non-association value 10–14%) were used as the material. The procedure of presentation and learning method was the same as that in test 2).

4) Immediate memory. 16 Japanese words were presented aurally at the rate of a word every 1.5 sec. and immediate reproduction of them was required. Ss were told to recall as many words as possible without respect to time and order, 8 of 16 words used were seletced as words related to the key words "kutsushita" (socks) based on the results obtained by an association test and the other items were irrelevant buffer items.

Results

1) Recall test; i) Reproduction of the problem. The result of this test cannot be adopted as data, because 4 of 12 Ss in experimental group did not take the examination and the performance of the other Ss was too poor (only 1 S in both exp. and cont. group respectively gave a nearly perfect recalling and 1 in each group recalled only the theme of the problem). ii) Recall of calssmates. As the meaning of the words "sitting next to" was ambiguous, the numbers in Table 1 include the case in which S recalled any classmate who was sitting in front of him or behind him or on the right or left side. But from these results no significant effect of sensory deprivation can be found.

Table 1. Recall of class-mate who was sitting next to the S.

Group	At the 1st year of / Degree of recall	High School	Middle School	Primary Scholl
exp. (N=12)	Recall with confidence	10	8	4
	Recall without confidence	0	3	1
	Failure of recall	2	1	7
cont. (N=11)	Recall with confidence	10	9	6
	Recall without confidence	1	0	1
	Failure of recall	0	2	4

2) Learning of verbal maze. The number of trials to the criterion are presented in Table 2. This result also does not show any significant difference between two groups.

3) Serial learning. The purpose of the pre-test, in which a list of adjectives was used as a learning task, is to inspect whether the learning ability of Ss in exp.

Table 2. Mean number of trials required to reach the criterion in verbal maze learning.

Group	Pre-	Post-
Exp. (N=11)	8.2	3.3
Cont. (N=11)	6.1	2.8

Table 3. Mean number of trials required to reach the criterion in serial learning.

Group	Pre- (Learning of adjectives)	Post- (Learning of 2-letter syllables)
Exp. (N=11)	12.9	10.8
Cont. (N=11)	12.5	9.6

group is the same as that of cont. group. The number of trials required to reach the criterion is shown in Table 3. There is no significant difference between groups in respect to the rate of learning. However, also in the post-test, in which a list of two-letter syllables was used, the difference between two groups is not significant. After all, from these results, it could not be found that sensory deprivation had any significant effect on the serial learning.

4) Immediate memory. The total number of recalled words is 81, exactly alike in both groups. The mean for a S is 7.36, which approximates so-called "magical number 7". If we devide the total number, however, into the related and buffer items, it can be seen that concerning the ratio of them the exp. group is opposed to the cont. group, i.e. the following tendency can be seen:

in exp. group related words < buffer items
in cont. group related words > buffer items

In cont. group the memory of the related words inhibits that of irrelevant buffer items. In exp. group, on the contrary, such inhibition is not seen and less related words are remembered than buffer items.

This tendency is considered to show the difference of the intensity of the organizing function in both groups. "Organizing" here means utilzing, consciously or unconsciously, the inter-relation among the related items by memorizing.

Table 4. Mean and total number of items recalled in immediate memory.

Group	Total	Mean	Related	Buffer	Related −Buffer	P
Exp. (N=11)	81	7.36	36	45	−9	$t_0=1.873$ df=20
Cont. (N=11)	81	7.36	44	37	7	$P<0.05$ (one-tailed)

In Table 4,–9 for exp. group and 7 for cont. group are the numbers obtained by subtracting the buffer items from the related items recalled in both groups. The difference between them is significant by t test at 5% level (one tailed, based on the findings that sensory deprivation deteriolates the organizing function of cognition). It means that sensory deprivation has a deteriorative effect on the organization of memory.

Fig. 1 shows the curves of serial position effect for both groups obtained by the socres given according to the order of recalling. From these curves it can be seen that the organizing function, especially the function of the key word, is lowered in exp. group.

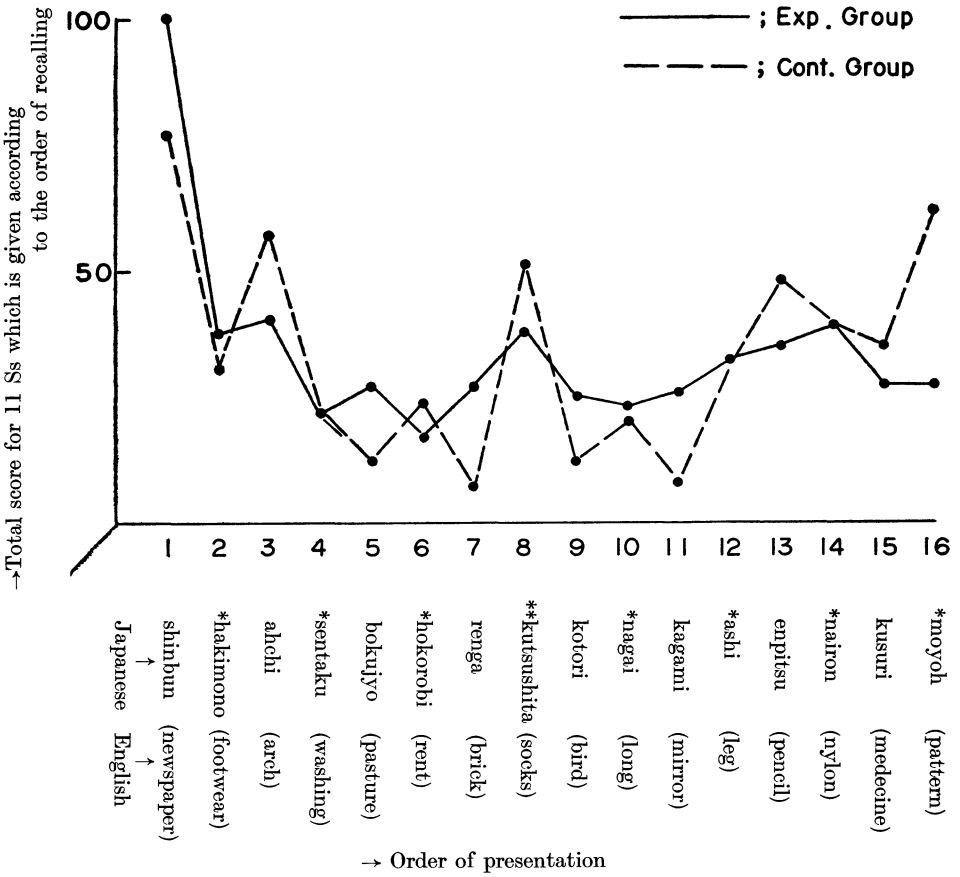

Fig. 1. Serial position effect in immediate memory.
*; related word **; key-word

Discussion

As to the effect of sensory deprivation on learning, the results thus obtained by the experiments were not conclusive. In the present study too, there is no

significant difference between two groups as to the rate of learning and the number of items recalled in the immediate memory. The effect on the recall of the previous experiences could not be ascertained because of the defect in the method.

The only significant effect found in these tests is a deteriorative one on the organizing function of the immediate memory. It may be said that immediate memory was influenced by sensory deprivation rather in its qualitative aspect than in its quantiative aspect. Now, although our data are too poor to determine the effect of sensory deprivation on learning or memory, it can be said that the effect varies with aspects or phases of learning. Therefore, further investigations are required to determine the effect generally. It must be regarded as an important view point of study whether the function taken up concerns itself mainly with the inner world of S's experience or with the treatment of the external world.

References

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Zusammenfassung

Der Einfluss von sinnlicher Entziehung auf das Lernen und Gedächtnis wurde unter Zuhilfename der Erinnerung von dem Erlebnis der Vergangenheit, des Lernens vom Sprach-Labyrinth, des Reien-lernens und unmittelbaren Gedächtnisses untersucht.

Die Ergebnisse der Untersuchung zeigten keinen signifikanten Unterschied zwischen den experimentalen und kontrolliert Gruppen in bezug auf die Erinnerung, die Geschwindichkeit des Sprach-lernens und die Menge des unmittelbaren Gedächtnisses. In unmittelbaren Gedächtnissen aber ergab sich aus der untersuchung, dass sich die Verschlechterung von der organisierenden Function im Gedächtnisse zeigte.